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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: SELF-POLISHING ANTIFOULING PAINT

(57) Abstract: A self-polishing antifouling paint comprising a binder and a biologically active substance, wherein said biologically active substance is chosen to be decomposable in the presence of water and to consume oxygen in its process of decomposition so as to generate an oxygen-lean aqueous environment in the water-exposed paint outer layer.

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### Self-polishing antifouling paint

The present invention relates to a self-polishing antifouling paint or boat-bottom paint of the kind defined in the preamble of Claim 1.

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Accordingly, the invention relates to an antifouling paint that includes a binder of relatively low mechanical strength so that the outer paint layer will be worn away by friction with the water and any organisms that have been able to fasten to the paint layer will be carried away with said layer.

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With the intention of reducing the number of organisms that fasten to the surface of an antifouling paint when the boat is generally stationary in the water, it is known to make the layer of the paint applied slippery. Moreover, it is also known to add to the paint one or more additives for further reducing the tendency of the organisms to rest on or fasten to the exposed surface of the self-polishing paint. The biologically active substances that are acceptable from an environmental aspect and which have hitherto been used to control the tendency or ability of marine creatures from fastening to the surface of the self-polishing paint, particularly such creatures as molluscs, barnacles, and the like, have a troublesomely low effect. Although being effective, other substances, for instance metal compounds such as copper oxide or tin salts, or TBT, are generally unacceptable from an environmental aspect.

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Accordingly, one object of the present invention is to provide a self-polishing paint which contains an environmentally acceptable substance that is effective in making it difficult for marine organisms, for example molluscs, barnacles, etc. from fastening to the water-exposed paint layer.

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Another object of the invention is to provide a self-polishing paint, which also includes a substance that obstructs the process of photosynthesis in respect of algae that have fastened to the surface of the paint.

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These objects of the invention are achieved, either completely or partially, with a self-polishing antifouling paint according to Claim 1.

Further embodiments of the invention will be apparent from the accompanying dependent Claims.

The invention is based on the insight that marine creatures, and particular molluscs, have a low tendency to fasten to a paint surface that has a low oxygen content. The invention is also based on the insight that the exposed outer paint layer can be given such a low oxygen content in an aqueous environment, by including in the paint a material which will decompose in the presence of water while consuming oxygen from the surrounding layer of lake water/sea water. Because of its low oxygen content and possibly also because of the decomposition products from said material, said water layer, which is thin and finds movement difficult by virtue of being received in pores and surface irregularities in the paint layer (particularly a porous outer layer of said self-polishing paint), results in a mollusc-unfriendly environment or milieu.

The material may be of a biological or chemical nature.

In one preferred embodiment, the material used is a biological material, preferably a material rich in protein, for example a vegetable material such as powdered soy. Said material, for instance the soy powder, will suitably have a particle size that lies in the range of 0.1-0.001 mm and will preferably be divided uniformly in the binder.

At least in some cases, the decomposition products of the material tend to provide an environment that is favourable to algae since they are able to provide an algae nutrient. It is therefore proposed in accordance with the invention that the inventive paint will also include a substance that obstructs the process of photosynthesis with respect to algae that fasten to the paint surface. Such photosynthesis inhibitors are well known in the art and have a relatively small environment loading effect when administered in effective dosages.

Irgarol is a known photosynthesis inhibitor that is compatible with known self-polishing antifouling paints. WO 00/77103 discloses an antifouling paint composition that is suitable with regard to self-polishing antifouling paint of the kind defined in the preamble of Claim 1. Other, older patent specifications mentioned in this latter publication can also be of interest in this regard.

Suitable paint compositions that provide a purposeful self-polishing effect can be read from said publication WO 00/77103.

### Example

There was prepared a paint composition corresponding to model paint composition A described in WO 00/77103, although the copper oxide was excluded and replaced with dry soy meal with a grain size of 0.01 mm. The paint was applied in a surface layer in accordance with the directions given in WO 00/77103.

Such a model paint composition A may include 98 percent solid substance volume of triisopropyl silyl acrylate, 2 percent solid substance volume of hydrogen substance/Disperbyk 164 (for example Byk Chemie, Germany), 2 percent solid substance volume, silica Aerosil 200 (for example Degussa, Germany), 2 percent solid substance volume, modified polyethylene wax, Aditix M60 X (for example Supercolori, Italy), 36 percent solid substance volume of soy flour. Solid substance volume ratio: 50; solvent xylene.

The paint was applied as an antifouling paint on a boat lying in Baltic Sea water. Once exposed to the water environment, the soy flour particles went through a biological decomposition process as the outer layer of paint consumed oxygen from the adjacent layer of water. Molluscs were found to have a low tendency to fasten to the outer paint layer.

The soy flour decomposition products were found to enhance the growth of algae. A comparison paint of the same composition but without soy (copper oxide) and including 0.05% Irgarol (registered trademark) gave no effect with regard to the growth of molluscs but had a pronounced limitation on the growth of algae on the paint surface in contact with the water, as a result of its algicidal effect.

The example shows that a self-polishing antifouling paint that contains a significant proportion of a material which decomposes in the presence of water while consuming oxygen from the adjacent layer of water limits the growth of molluscs on the paint and that the photosynthesis inhibitor included in the paint is able to control the increase in the growth of algae on the surface of the paint layer.

The amount of biologically active substance contained by the paint will correspond to the requisite oxygen consumption over the expected lifetime of the paint.

5 The biologically active substance can be chosen from among chemical substances and biological substances that provide said oxygen consumption in the water layer present in the wet surface layer of the self-polishing paint, said surface layer being sponge-like and thereby significantly restricting the mobility of the contained water mass.

10 It is preferred in accordance with the invention to use a biological material which consumes oxygen when decomposing in a water environment. In addition to soy flour, there can be used fishmeal, egg powder, ground sea kelp and other similar material.

15 The biologically active material is incorporated in inventive antifouling paint compositions in an amount corresponding to 10-50 percent by weight, particularly with regard to the paint composition exemplified above in which dry soy flour was incorporated.

## CLAIMS

1. A self-polishing antifouling or boat-bottom paint comprising a binder and a biologically active substance, **characterised** in that said biologically active substance is  
5 chosen to be decomposable in the presence of water and to consume oxygen during its decomposition process so as to generate an oxygen-lean aqueous environment in the water-exposed paint layer.
2. A self-polishing antifouling paint according to Claim 1, **characterised** in that it  
10 includes a photosynthesis inhibitor for limiting the growth of algae on the surface of the said paint.
3. A self-polishing antifouling paint according to Claim 1 or 2, **characterised** in that the biologically active substance includes a material of biological origination.  
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4. A self-polishing antifouling paint according to Claim 3, **characterised** in that the biologically active substance includes a protein-rich material.
5. A self-polishing antifouling paint according to any one of Claims 1-4, **characterised**  
20 in that the biologically active substance is a powdered substance which is distributed uniformly in the paint composition.
6. A self-polishing antifouling paint according to Claim 5, **characterised** in that the powder has a particle size between 0.1 mm and 0.001 mm.  
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7. A self-polishing antifouling paint according to Claim 5 or 6, **characterised** in that the biologically active substance is soy flour.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/01362

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C09D 5/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C09D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0869159 A1 (INSTITUUT VOOR AGROTECHNOLOGISCH ONDERZOEK), 7 October 1998 (07.10.98), abstract --	1-7
A	US 5770188 A (RYOJI HAMADE ET AL), 23 June 1998 (23.06.98), abstract --	1-7
A	WO 0077102 A1 (J.C. HEMPEL'S SKIBSFARVE-FABRIK A/S), 21 December 2000 (21.12.00), abstract --	1-7

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
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- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&amp;" document member of the same patent family

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0194479 A1 (J.C. HEMPEL'S SKIBSFARVE-FABRIK A/S), 13 December 2001 (13.12.01), abstract  -----	1-7



# INTERNATIONAL SEARCH REPORT

Information on patent family members

06/09/03

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
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